U.S. Department of Transportation

Federal Aviation Administration

Standard

PREPARATION OF INTERFACE CONTROL DOCUMENTATION

INITIATED BY: AES-120

The IRD is a procurement oriented document, and is used by the FAA (or a contractor under contract to the FAA for the production of specification documentation) to specify the interface requirements of a subsystem/equipment item. An IRD is also used to ensure that the requirements for interface with existing subsystem/equipment items and new subsystem/equipment items are agreed to by all affected FAA project offices and are imposed on the prospective contractor in a clear and concise manner.

The ICD is a contractor level working document, approved by the FAA, which documents how the design will meet the interface requirements imposed by the IRD. The ICD and IRD share a common format to aid in requirements traceability, clarity, and ease of use.

The IR is used to revise interface control documentation, and to ensure that proper incorporation of revisions takes place. The IR is designed to work within established FAA Configuration Management procedures.

Designed to integrate with existing FAA documentation and configuration management practices, IRDs, ICDs, and IRs will ensure that implementation of the subsystems and equipment items of the NAS Plan occurs in a controlled, technically correct, cost effective manner.

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Table List of Tables

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Requirements Document (IRD), an Interface Control Document (ICD), and an Interface Revision (IR). A description of the contents of each document is presented.

1.3 Classification. This standard covers three types of interface documents; the Interface Requirements Document (IRD), the Interface Control Document (ICD), and the Interface Revision (IR).

1.3.1 Interface Requirements Document (IRD). An IRD is a formal agreement which documents the requirements and specifications of National Airspace System (NAS) interfaces.

1.3.2 Interface Control Document (ICD). An ICD is a formal agreement which documents how the interface requirements are implemented in the design of the respective subsystem/equipment item.

1.3.3 Interface Revision (IR). An IR is the form used to effect a change to interface control documentation.

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STANDARDS

FAA

FAA-STD-002	Facilities Engineering Drawing Preparation
FAA-STD-005	Preparation of Specification Documents
FAA-STD-023	Microfilming of Engineering and Electrical Drawings

Military

DOD-STD-100	Engineering Drawing Practices
DOD-STD-2167	Defense System Software Development

OTHER

DI-MCCR-80026	Data Item Description (DID) for Interface Requirements Specification

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Non-government documents. The following documents of the issue in effect on the date of invitations for bid or request for proposal, form a part of this standard to the extent specified herein. In the event of conflict between the document referenced herein and the contents of this standard, the contents of this standard shall be considered the superseding requirement.

STANDARDS

International Organization for Standardization (ISO)

ISO 7498	Information Processing Systems-Open Systems Interconnection-Basic Reference Model.

among technical groups and using Federal agencies.)

standard) shall show a complete Figure 1 format within its pages. If an item required by the Figure 1 format is not required to completely document an interface, it shall be noted by use of the term "Not Applicable" (N/A).

3.1.2 ICD format. ICD format shall comply with the format presented in Figure 2 of this standard. Each ICD (as defined in Section 6 of this standard) shall show a complete Figure 2 format within its pages. If an item required by the Figure 2 format is not required to completely document an interface, it shall be noted by use of the term "Not Applicable" (N/A).

3.1.3 IR format. IR format shall comply with the format presented in Figures 3 and 4 of this standard. Each IR shall show a complete Figure 3 and 4 format within its pages. If an item required by the Figure 3 and 4 format is not required to completely document an interface revision, it shall be noted by use of the term "Not Applicable" (N/A).

3.1.4 Basic approach. Standards and specifications shall be used to document interfaces (as defined in Section 6 of this standard) whenever possible. Drawings and tables shall be used to supplement standards and specifications, or in those instances when a standard or specification is not available. Written text in the form of narrative or notes shall be used to supplement interface documentation on an "as required" basis.

3.1.5 Use of government or industry standards and specifications. Whenever government or industry standards and specifications are referenced in an IRD/ICD, the information they contain becomes part of that document. To provide a baseline agreement, the IRD/ICD shall record the standard or specification identification number and release date, or applicable revision letter and date in force at the time of IRD/ICD preparation. Standards/specifications may also be reflected in an IRD/ICD for information or clarification. When this is done, the referenced document shall end with "(ref.)" and shall not include the revision letter and date.

of Contents, and Effectivity pages are numbered by use of lower case Roman numerals. The page containing 1. SCOPE, shall be page number 1. IRD/ICD pages shall be consecutively numbered beginning with page number 1. Decimal page numbers shall be used to add revision pages, i.e., 1.1.

3.1.8 IRD/ICD standards. IRDs and ICDs shall be prepared in the language and style of FAA-STD-005. Drawings used to satisfy the documentation requirements of an IRD/ICD shall conform to FAA-STD-002 or DOD-STD-100 as applicable. Clarity and legibility of all IRDs and ICDs shall meet the reproducibility requirements of FAA-STD-023.

3.2 IRD/ICD Administrative requirements. The following administrative requirements shall apply to all IRDs and ICDs:

3.2.1 Cover. The cover of an IRD/ICD shall utilize FAA WA FORM 4510-1. (Figure 5 for IRDs, Figure 6 for ICDs).

3.2.1.1 Document number. Document numbers shall appear on the cover and each subsequent page of the IRD/ICD. Additional volumes of the same number shall also show the appropriate volume number on each page. Document numbers shall be obtained from the FAA.

3.2.1.2 Revision letter. The revision letter shall appear on the cover and each subsequent page of the IRD/ICD.

3.2.1.3 Titles. Titles shall identify the interfacing subsystem/equipment items.

3.2.2 IRD/ICD Approval signature page. The first page of an IRD/ICD shall be the approval signature page. An IRD approval signature page shall conform to Figure 7. An ICD approval signature page shall conform to Figure 8.

3.2.3 Revision record. The second page of the IRD/ICD shall contain a revision record and history of revisions incorporated into the document. The "REV LTR" column shall show the revision letter assigned at the time of each incorporation. The "DESCRIPTION" column shall briefly describe the revision

multi-volume documents shall summarize the effectivity. (Figure 10)

3.2.4.1 "LOCATION" column. The "LOCATION" column shall indicate the physical location of the interface and shall be as specific as possible.

3.2.4.2 "INTERFACE EFFECTIVITY DATE" column. The "INTERFACE EFFECTIVITY DATE" column shall contain the date(s) when the interface becomes effective at the subject location. Either calendar dates or a certain number of days after a specific milestone shall be used.

3.2.5 Table of contents. The fourth page of the IRD/ICD shall begin a table of contents. The table of contents shall outline the contents of the document by major sections and paragraphs. Each section and paragraph number shall be listed in the order in which they appear in the document. Their respective descriptions and page numbers shall be indicated in parallel columns. (Figure 11)

3.3 Interface Requirements Document (IRD). IRDs shall be prepared in accordance with Appendix I.

3.4 Interface Control Document (ICD). ICDs shall be prepared in accordance with Appendix II

3.5 Interface Revision (IR). IRs shall be prepared in accordance with Appendix III

4. QUALITY ASSURANCE PROVISIONS

This section is not applicable to this standard.

5. PREPARATION FOR DELIVERY

This section is not applicable to this standard.

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above actions is considered to be a contractor for configuration management purposes.

6.1.2 Equipment item. Identifiable piece of hardware and/or software which can be bounded with specification and interface definitions.

6.1.3 Facility. The total plant (e.g. Building, Structure, Enclosure, Assembly, Open-Air Plan "site") required for a subsystem or equipment item to function. The facility will (at a particular geographic location) house, support, and protect the subsystem/equipment item. Facility characteristics will be determined by the total complement of dependent subsystems/equipment items.

6.1.4 Interface. A common functional and/or physical boundary where hardware/software interact.

6.1.5 Interface Requirements Document (IRD). The IRD is a formal agreement which establishes design requirements for interfaces between subsystems or a subsystem and its supporting facility. The purpose of an IRD is to impose interface design requirements.

6.1.6 Interface Control Document (ICD). The ICD is a formal agreement (usually between affected contractors) which documents how interface design requirements have been fulfilled. The ICD identifies, qualifies and controls the characteristics of interfaces between a subsystem/equipment item or a subsystem and equipment item and its host facility. The purpose of the ICD is to assure interface compatibility by documenting form, fit and function required to satisfy installations, checkout and operations. The ICD will serve as a record of interface agreements and as a basis for developing coordinated design changes.

6.1.7 Subsystem. A grouping of one or more equipment items that is a relatively independent identifiable entity.

6.1.8 Functional interfaces. Functional interfaces are interfaces which interact across non-material boundaries. Functional interfaces are described in terms of information transfer per the ISO/OSI seven layer model as discussed herein and in ISO 7498.

6.2 Abbreviations and acronyms. The following are abbreviations and acronyms used in this standard.

A	Analysis
ANSI	American National Standards Institute
cg	center of gravity
D	Demonstration
DCE	Data Communication Equipment
DID	Data Item Description
DTE	Data Terminal Equipment
DT&E	Developmental Test & Evaluation
EMC	Electromagnetic Compatibility
EMP	Electromagnetic Pulse
FAA	Federal Aviation Administration
FAATC	FAA Technical Center
I	Inspection, Investigation
ICD	Interface Control Document
IEEE	Institute of Electrical and Electronic Engineers
IR	Interface Revision
IRD	Interface Requirements Document
N/A	Not Applicable
NAS	National Airspace System
ISO	International Organization for Standardization
OSI	Open Systems Interconnection
OT&E	Operational Test & Evaluation
RF	Radio Frequency
S	Similarity
T	Test
T D&D	Technical Data and Documentation
V	Validation
VRTM	Verification Requirements Traceability Matrix

Revision Record

Effectivity

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Figure 2. ICD Format Outline (cont'd)
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CONTRACTOR	APPROVED	DATE	NAS		(30.3.3.3) DOCUMENT PAGE/ VOL NUMBER
	(30.3.3.7)			DOCUMENT NUMBER (30.3.3.1)	
			INTERFACE REVISION	INTERFACE CONTROL	(30.3.3.4) IR NUMBER
			DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION	(30.3.3.2)	(30.3.3.5) IR PAGE
				DOCUMENT TITLE	(30.3.3.6) REV LTR

(30.3.4 all subparagraphs)

REASON (30.3.3.8)

Figure 3. Interface Revision Form (IR)

NAS INTERFACE REVISION CONTINUATION

APPROVED (30.3.3.7)	APPROVED	(30.3.3.1) DOCUMENT NUMBER	(30.3.3.3) DOC PAGE VOL NUMBER	(30.3.3.4) IR NUMBER
APPROVED	APPROVED			(30.3.3.5) IR PAGE

(30.3.4)

Figure 4. IR Continuation

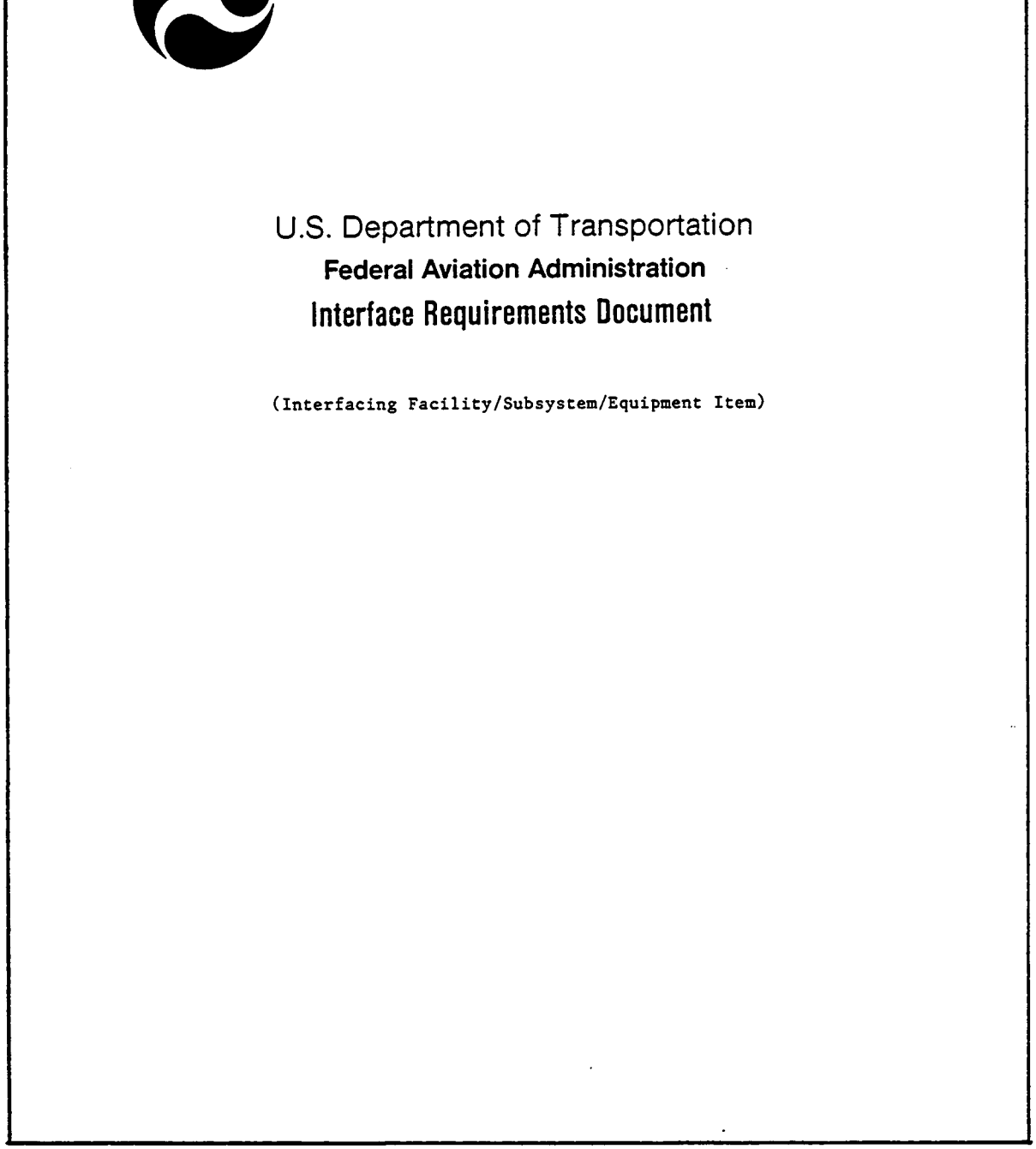

Figure 5. IRD Cover Page (FAA WA Form 4510-1)

U.S. Department of Transportation

Federal Aviation Administration

Interface Control Document

(Interfacing Facility/Subsystem/Equipment Item)

Figure 6. ICD Cover Page (FAA WA Form 4510-1)

APPROVAL SIGNATURE PAGE

(interfacing facility/subsystem/equipment item)

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
PROJECT A		
PROJECT B		
SYSTEM ENGINEERING		

Figure 7. IRD Approval Signature Page

APPROVAL SIGNATURE PAGE

(interfacing facility/subsystem/equipment item)

APPROVAL SIGNATURES		
PARTICIPANT	NAME	DATE
CONTRACTOR A		
CONTRACTOR B		
PROJECT A		
PROJECT B		

Figure 8. ICD Approval Signature Page

REVISION RECORD			
REV. LTR	DESCRIPTION	DATE	ENTERED BY

Figure 9. IRD/ICD Revision Record

EFFECTIVITY	
LOCATION	INTERFACE EFFECTIVITY DATE

Figure 10. IRD/ICD Effectivity Page

Paragraph | Description | Page

Figure 11. IRD/ICD Table of Contents

L = Verified by lower level requirement
X = Not applicable S = Similarity A = Analysis I = Inspection D = Demonstration T = Test V = Validation of Records

SECTION 3 REQUIREMENTS PARAGRAPH REFERENCE		VERIFICATION PHASE AND METHOD			
		SUBSYS ACCEPT TESTING	SYSTEM INTEG TESTING	SITE ACCEPT TESTING	REMARKS
3.1	General Requirements	T	T	D	
3.2	Functional Requirements	T	T	T	
3.3	Physical Requirements				Title
3.3.1	Mechanical Requirements	I	I	I	
3.3.2	Electrical/Electronic Requirements	T	T	D	
3.3.3	Environmental Requirements	X	I	D	
3.3.4	Envelope Requirements	I	I	X	

(EXAMPLE)

10.1 Section 1, SCOPE. The contents of Section 1, SCOPE shall be as follows:

10.1.1 Paragraph 1.1, Scope. The scope shall be a summary of the contents of the document and its intended purpose.

10.1.2 Paragraph 1.2, Subsystem/equipment item responsibility list. The subsystem/equipment item responsibility list shall appear immediately after the scope. It shall consist of a list of interfacing hardware/software/facilities, along with their respective identification numbers, common name, and the participant responsible for their design. (Facility, subsystem, and equipment item shall be as defined in Section 6 of this standard.)

10.2 Section 2, APPLICABLE DOCUMENTS. Applicable documents shall be listed in accordance with FAA-STD-005 format. The contents of this section shall be as follows:

10.2.1 Paragraph 2.1, Government documents. This paragraph of the IRD shall list the government source documents (standards, specifications, publications, etc.) used in the IRD.

10.2.2 Paragraph 2.2, Non-government documents. This paragraph of the IRD shall list the non-government source documents used in the IRD.

10.2.3 Paragraph 2.3, Related IRDs. This paragraph shall list the IRDs that are directly impacted by, or which impact, this IRD. Related IRDs shall be listed by number and complete title. If there are no related IRDs, the word "none" shall be entered.

10.3 Section 3, INTERFACE REQUIREMENTS. This section of the IRD shall document the general, functional, and physical requirements of the interface between subsystem/equipment items and other subsystem/equipment items or their facilities. Design requirements in the following paragraphs shall be documented as necessary, and only to the extent necessary, to define the requirements of the interface.

source, sink, size, frequency), protocols, etc., in accordance with the Open Systems Interconnection (OSI) architecture defined in International Standard ISO 7498. Message content shall be defined by the Interface Requirements Specification Data Item Description (DID) DI-MCCR-80026 required by DOD-STD-2167. The IRD shall identify standard protocols, when available, as design constraints, or when not available, functional requirements shall be identified as necessary to define each of the seven layers of the architecture. Each IRD shall have its respective content organized according to the following: Application layer, Presentation layer, Session layer, Transport layer, Network layer, Data link layer, and Physical layer. This paragraph shall be used to provide general information on the functional interface.

10.3.2.1 Paragraph 3.2.1, Application layer. This portion of the IRD shall define the functional and/or procedural requirements needed to allow application processes (as defined in Section 6 of this standard) to access the information transfer processes. Requirements which shall be defined may include, but are not limited to: identification of intended communications partners, their current availability to communicate, establishment of the authority procedures determination of the acceptable quality of service, and synchronization of cooperating applications.

10.3.2.2 Paragraph 3.2.2, Presentation layer. This portion of the IRD shall define the functional and/or procedural requirements needed to negotiate the differences in the representation of information being transferred between application processes. Requirements for negotiation of transfer syntax for character sets, test strings, data display formats, graphics syntax, file organization and data types shall be specified.

10.3.2.3 Paragraph 3.2.3, Session layer. This portion of the IRD shall define the functional and/or procedural requirements needed to organize and synchronize the dialogue and to manage the information exchange between application processes. Characteristics for synchronization of end user tasks, mapping tables for names to addresses, dialog control (who, when, how long, half or full duplex), graceful session connection establishment/termination, encryption, and applicable protocols shall be specified.

10.3.2.4 Paragraph 3.2.4, Transport layer. This portion of the IRD shall define the functional and/or procedural requirements needed to provide end-to-end control and information interchange with the reliability and

define the functional and/or procedural requirements needed to establish, maintain, and terminate switched connections between application processes. Applicable protocol, user options, timer characteristics, window size, logical connectivity requirements, and logical channel assignments shall be defined. Network aspects of analog systems shall also be documented. These include in-band and out-of-band signalling, addressing and route selection, status control, message generation, flow control and alternate trunk routing, grade-of-service, queuing and priority requirements, and internetworking.

10.3.2.6 Paragraph 3.2.6, Data-link layer. This portion of the IRD shall define the functional and/or procedural requirements needed to provide the logical establishment of data link connection, error detection and recovery, and flow control between stations transferring information. Link control protocol and related options shall be identified, including link level addressing, prefixes, supervisory sequences, minimum and maximum timer values, timer start/reset mechanisms, and recovery actions. The operation mode and command/response repertoire shall also be included for bit-oriented protocols. Analog network signalling requirements shall be documented. These include signalling sequence definition, signalling error detection, and protocols for querying event status signalling.

10.3.2.7 Paragraph 3.2.7, Physical layer. This portion of the IRD shall define the functional and/or procedural requirements needed to activate, maintain, and deactivate the physical connection between the peer data link entities being served. This portion shall define which piece of equipment is Data Terminal Equipment (DTE), and which is Data Communication Equipment (DCE). Information pertinent to the functions performed at the physical layer, including the protocol to be used, shall also be defined. Analog system physical layer requirements shall be documented. In addition, any methods or schemes used to detect signal quality or channel equipment problems shall be documented. Electrical and mechanical characteristics are physical interface related and are discussed in paragraph 10.3.3 of this document.

10.3.3 Paragraph 3.3, Physical requirements. This subsection shall describe the requirements of physical interfaces (as defined in Section 6 of this standard) in terms of mechanical, electrical/electronic, environmental and/or envelope design requirements.

interfacing facilities/subsystems/equipment items in their installed (or "mated") condition. In addition, the "halves" of the interface shall be separated and shown in detail views. Only that portion of the hardware applicable to the interface need be shown. Each component or part shall be identified along with the participant responsible for supplying it.

10.3.3.1.1.1 Paragraph 3.3.1.1.1, Interchangeability. Interchangeability shall be assured by careful documentation of all interfacing facility/subsystem/equipment item dimensions. This documentation shall include nominal dimensions with minimum and maximum tolerances. Requirements for special tooling or statistical analysis to insure interchangeability of close tolerance components shall be thoroughly documented.

10.3.3.1.1.2 Paragraph 3.3.1.1.2, Surface finish. Surface finish considerations for interfacing surfaces shall be addressed by use of Government or industry standards or specifications. If no standard or specification is available or appropriate for the subject interface, all necessary information shall be included.

10.3.3.1.1.3 Paragraph 3.3.1.1.3, Location and orientation. Equipment and connectors shall be located with respect to recognized datum features or bench marks. Location shall be shown in two different views.

10.3.3.1.1.4 Paragraph 3.3.1.1.4, Holes. Hole callouts shall give all information necessary to assure compatible mating of interfacing components. Parameters to be considered include: datum references, diameter, depth, angularity, counterbore, counter-sink, spot face chambers, slotted holes, tolerances and protective finish.

10.3.3.1.1.5 Paragraph 3.3.1.1.5, Fasteners. Fasteners used to assemble interfacing components shall be identified by use of the appropriate Government or industry standard or specification number. If a standard or specification number is not available, all fastener pertinent to the interface shall be described. Requirements to be considered shall include head type, size, diameter, tolerance, thread definition, length, material, finish, and torque/installation requirements.

required, the weights of interfacing components shall be specified using appropriate units and the cg location shall be given with respect to known datum features.

10.3.3.1.1.8 Paragraph 3.3.1.1.8, Materials. Materials at interfacing surfaces shall be identified by Government or industry material standards or specifications. If a standard or specification is not available, the material requirements of the interface shall be fully documented.

10.3.3.1.1.9 Paragraph 3.3.1.1.9, Markings. Hardware markings which affect interface relationships, such as orientation arrows, warnings, or part identifiers, shall be carefully and completely documented on the drawing required by this subsection.

10.3.3.1.2 Paragraph 3.3.1.2, Connectors. All electrical/electronic connectors shall be documented by use of the applicable Government or industry standard or specification. If no standard or specification is available, the electrical and mechanical interface requirements shall be fully documented in the IRD. Mechanical requirements shall include size, pin/socket configuration, keyway indexing and tolerance, materials, finish, and torque. Electrical requirements shall include pin-to-pin isolation, breakdown voltage, contact resistance dielectric properties, shell conductivity and bonding. The requirements of this paragraph may be satisfied through the use of a combination of mechanical drawings, interface block diagrams, system descriptions, schematics, and interface wiring diagrams.

10.3.3.1.3 Paragraph 3.3.1.3, Fluids (gases and liquids). Fluid interface requirements shall be documented by use of standards and specifications. If none are available, all parameters of the fluid interface shall be individually documented. These parameters include pipe, tube, or hose diameters, composition, operating, and proof pressures. Clamp and fitting installation torque values, operating and proof pressures shall be documented. The contractor or organization responsible for supplying each item of a fluid interface shall be identified.

Electrical requirements shall be defined as relating to the transfer of power between subsystems or equipment items within a facility. Electronic requirements shall be defined as relating to the process of signaling, controlling, or transferring information. Electrical/electronic requirements shall be documented in a manner which allows easy differentiation when they are both present in the same interface.

10.3.3.2.1 Documenting electrical/electronic requirements. Due to the complex interrelationships existing between facilities, subsystems, and equipment items of the NAS, specialized and detailed electrical/electronic drawings may be required in addition to standards and specifications to adequately document interfaces. The following are acceptable forms of specialized electrical/electronic interface documentation:

10.3.3.2.2 Paragraph 3.3.2.1, Electrical/electronic block diagrams. Block diagrams shall be employed to depict facility/subsystem/equipment item electrical/electronic interface relationships. Multiple level block diagrams shall be used to depict complex relationships. At a minimum, a block diagram shall:

a. Identify the interfacing facility/subsystem/equipment items by title, reference number, and responsible FAA project office/contractor. Interconnecting cables shall be identified by reference number and supplier. The responsible FAA project office/contractor shall be identified on each side of the interface.

b. Show the interconnecting relationship(s).

c. Locate the interface.

If an interface(s) is also described in another IRD, that document shall be referenced on the block diagram and in 1.3 of this IRD.

10.3.3.2.3 Paragraph 3.3.2.2, System description. A system description shall be provided to complement and supplement complex or multiple level block diagrams. It shall consist of a brief explanation of the purpose of the system, its operational requirements, and the role of each interfacing subsystem/equipment item.

and the wiring configuration of each. Signal/function-to-pin assignments shall be defined for each connector half to assure proper connection of the circuits involved. In addition to the above, the following requirements shall be documented:

a. Hookup. Show all wires including jumpers, splices, spares, etc. Identify all unconnected pins including uninstalled pins, etc.

b. Wire/cable characteristics. Specify wire type, conductor size (American Wire Gage number), conductor material, jacket material, insulation volt rating, color code, etc. Military, industry, or contractor specifications may be referenced for the above information, if available. Also record wire lengths, maximum resistances, cable capacitance, characteristic impedance, etc., as appropriate. When cable routing is critical to maintain electromagnetic compatibility (EMC) or electromagnetic pulse (EMP) isolation, special notes, twist requirements, views, etc., shall be included.

c. Shielding. Show shield groupings within equipment and cables, shield treatment of connectors for referencing to structure (both overall cable shields and individual wire/pair shields) or for carrying shields through interfaces, shield tie points, ohmic requirements for terminating shields, etc.

d. Bonding and surface preparation. Define any special surface characteristics or preparations such as flatness, stiffness, cleaning, coating, and/or plating requirements, etc.

e. Electrical/electronic referencing (grounding). Show how each circuit is connected to the common electrical reference(s) for power and signals as applicable.

10.3.3.2.6 Paragraph 3.3.2.5, Power capacity. Power interfaces shall be defined by specifying the required output characteristics of the supply, the range(s) of loading over which they apply and tolerances. All modes of operation shall be considered: turn-on, turn-off, warmup, continuous, normal, load change, standby, emergency, etc. Power interface requirements to consider include:

e. Ripple,

f. Wave form,

g. Polarity (±), number of phases, phase rotation,

h. Protection (over voltage, under voltage, current limiting, short circuit),

i. Dynamic source impedance,

j. Maximum power and power factor,

k. Load profiles,

l. Maximum permissable noise level.

10.3.3.3 Paragraph 3.3.3, Environmental requirements. The following are environmental requirements of interfaces which shall be documented:

10.3.3.3.1 Paragraph 3.3.3.1, Thermal. Thermal requirements (temperature and relative humidity) which effect hardware/software operation and longevity shall be addressed.

10.3.3.3.2 Paragraph 3.3.3.1.1, Passive heat transfer. Requirements shall be imposed to prevent heat generated by operating equipment from damaging the generating equipment or adjacent equipment. Operating temperature ranges, heat transfer rates, conduction, convection radiation, and maximum allowable duration of heat transfer shall be considered.

10.3.3.3.3 Paragraph 3.3.3.1.2, Cooling. Cooling requirements shall be expressed for both normal and emergency environmental control system modes. In the case of forced air cooling, the parameters of heat dissipation, air mass flow rate, temperature, relative humidity, and maximum static pressure shall be considered. Liquid cooled systems shall include consideration of coolant chemical composition, rate of heat dissipation, coolant temperature requirements and tolerances, pull down and recovery rates, flow direction and resistance, etc.

10.3.3.4 Paragraph 3.3.4, Envelope requirements. Minimum and maximum space requirements of subsystem/equipment items shall be controlled by a drawing to assure facility and mutual compatibility and to mitigate possible detrimental interaction. Space requirements shall include cable diameter, bend radii, and support. Envelope requirements shall also be related to the environmental requirements discussed in 10.3.3.3 of this Appendix.

10.4. Section 4, QUALITY ASSURANCE PROVISIONS.

10.4.1 General. This section shall define the process for verification of interface requirements presented in Section 3 of the IRD. It shall describe verification philosophy and requirements, documentation and special test requirements, and responsibilities necessary to assure adequate verification of all section 3 requirements. It shall also define the types of tests to be performed. A Section 4 (as outlined in Figure 1) shall be contained in each IRD.

10.4.2 Paragraph 4.1, General. This paragraph shall present a short, general overview of the verification process to be used to verify the requirements of the IRD.

10.4.3 Paragraph 4.2, Responsibility for verification. This paragraph shall indicate the contractor or organization responsible for the verification of the Section 3 interface requirements.

10.4.4 Paragraph 4.3, Special test support requirements. This paragraph shall define any special test support requirements. This shall include special instrumentation for recording interface signals/data, data reduction computer programs and support required from one contractor or organization to enable the other contractor(s) or organization(s) to complete their verification activities (provide a magnetic tape containing expected inputs in the specified format, provide a female connector as specified, etc).

10.4.5 Paragraph 4.4, Verification methods and rationale. This paragraph shall describe the verification methods to be used in verifying each Section 3 requirement and the rationale for their selection. This paragraph shall list

procedures, items, or services. Inspection shall be used to verify construction features, document and drawing compliance, workmanship and physical condition.

10.4.5.1.2 Software. Software examination, as a method of verification, consists of inspection, without the use of special laboratory appliances or procedures to determine compliance with requirements. This nondestructive examination includes review of software source and object listings to verify compliance with software documentation, requirements and coding standards as well as verification of the implementation of required mathematical equations. The success criterion for inspections shall be pass/fail.

10.4.5.1.3 Technical data and documentation (TD&D). Verification by inspection shall be the primary method of verifying technical data and documentation (TD&D). The inspection task shall consist of comparing the TD&D with the appropriate compliance and reference documents. Variations shall be identified and recommendations shall be made to accept as written, rewrite all or the specific part(s) of the document, or to obtain a compliance deviation. The verification rating scale shall be pass, pass with exceptions, or fail.

10.4.5.2 Test (T).

10.4.5.2.1 Hardware. Hardware test measures performance during or after the controlled application of functional and/or environmental stimuli. Measurements require the use of laboratory and special test equipment, procedures, items and/or services.

10.4.5.2.2 Software. Software test employs technical means including evaluation of functional operation by use of special equipment or instrumentation, simulation techniques, and the application of established principles and procedures to determine compliance with requirements. Test performance is the means of creating data for detailed analysis. The analysis of data derived from test is an integral part of the activity.

10.4.5.2.3 Technical data and documentation (TD&D). Certain TD&Ds are candidates for testing with both contractor and operational personnel. Items such as fixed response time procedures that are controlled by a technical document or directive shall be candidates for verification by

used without special test equipment or instruction to verify characteristics such as operational performance, human engineering features, service, access features, and transportability. Demonstrations are used to determine "pass/fail" conditions.

10.4.5.3.2 Software. Software demonstration is limited to a readily observable functional operation to determine compliance with requirements. Demonstration is primarily used for activities where data gathering is not appropriate verification. Demonstrations are used to determine "pass/fail" conditions.

10.4.5.3.3 Technical data and documentation (TD&D). Verification by demonstration of TD&D shall consist of contractor and/or operational personnel being observed using the TD&D to perform the tasks for which the TD&D was generated. The rating scale for this technique shall be a pass, pass with qualifications, or fail judgement regarding the successful completion of the tasks by the personnel utilizing the TD&D.

10.4.5.4 Analysis (A).

10.4.5.4.1 Hardware.

a. Engineering analysis. This type of analysis is usually an engineering design function. It involves study, calculation, or modeling of known or potential failure modes, reaction or interactions of specified parts, materials, and processes, and the design configuration with the known function, performance and/or probable effects of the operational environments. This analysis is normally used to verify margin when it is not desirable to test to failure.

b. Similarity (S) analysis. Similarity analysis is a method applied to end-items or components that are identical in design and manufacturing processes to end-items or components that have been previously qualified to equivalent or more stringent requirements.

c. Validation (V) of records analysis. Validation of records analysis is a method of verification wherein manufacturing records are used as a method to verify compliance of concealed construction features or processes of manufacturing.

Verification Requirements Traceability Matrix (VRTM), Table I of this standard. These phases, subsystem acceptance testing, system integration testing and site acceptance testing, are used to emphasize the level of testing during which specific requirements are to be verified and the method of verification to be applied. This paragraph shall list only the phases applicable to the particular IRD.

10.4.5.5.1 Subsystem acceptance testing. This phase of verification is comparable to Developmental Test and Evaluation (DT&E) level testing and is usually conducted at the contractor's facility. It culminates in the acceptance testing of a configuration equipment item. NAS subsystem requirements shall be verified to the maximum extent practical at this level to avoid the more costly correction of design flaws discovered later during NAS system integration testing.

10.4.5.5.2 System integration testing. This phase of verification is that testing conducted during Operational Test and Evaluation (OT&E) to determine that the hardware/software to be deployed for site installation will perform in a NAS environment, in accordance with system level operational and performance requirements. This phase of testing does not include the integration testing conducted at a subsystem level during DT&E. This verification involves assuring that hardware/software functions as specified with simulated and, if possible, actual inputs. NAS system integration testing involves the operational verification of a NAS subsystem after it is placed in its intended NAS environment. It is conducted at the FAA Technical Center (FAATC) and/or the key site.

10.4.5.5.3 Site acceptance testing. This verification phase emphasizes the demonstration of overall system performance requirements at an operational site. Demonstration and inspection are the methods most often employed during this phase. Subsystem/equipment item site acceptance testing is also conducted during this phase.

10.4.6 Paragraph 4.6, Quality conformance inspections. Compliance with the requirements of Section 3 shall be documented in a Verification Requirements Traceability Matrix (VRTM) as shown in Table I of this standard. This table accomplishes document traceability from interface design and performance requirements through test procedures and test reports. The VRTM shall show that all the interface requirements have been reviewed and a valid

cases, etc.). These additional verifications shall be cross referenced to the appropriate Section 3 requirement in the VRTM remark column.

10.5 Section 5, PREPARATION FOR DELIVERY.

This section is not applicable to this appendix.

10.6 Section 6, NOTES.

10.6.1 Paragraph 6.1, Definitions.

10.6.2 Paragraph 6.2, Abbreviations and acronyms.

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20.1 Section 1, SCOPE. The contents of section 1, Scope, shall be as follows:

20.1.1 Paragraph 1.1, Scope. The scope shall be a summary of the contents of the document and its intended purpose.

20.1.2 Paragraph 1.2, Subsystem/equipment item responsibility list. The subsystem/equipment item responsibility list shall appear immediately after the scope. It shall consist of a list of interfacing hardware/software/facilities, along with their respective identification numbers, common name, and the participant responsible for their design.

20.2 Section 2, APPLICABLE DOCUMENTS. Applicable documents shall be listed in accordance with FAA-STD-005 format. The contents of this section shall be as follows:

20.2.1 Paragraph 2.1, Government documents. This paragraph of the ICD shall list the government source documents (standards, specifications, publications, etc.) used in the ICD.

20.2.2 Paragraph 2.2, Non-government documents. This paragraph of the ICD shall list the non-government source documents used in the ICD.

20.2.3 Paragraph 2.3, Related ICDs. This paragraph shall list the ICDs that are directly impacted by, or which impact, this ICD. Related ICDs shall be listed by number and complete title. If there are no related ICDs, the word "none" shall be entered.

20.3 Section 3, INTERFACE CHARACTERISTICS. This section of the ICD shall document the general, functional, and physical characteristics of the interface between subsystem/equipment items and other subsystem/equipment items or their facilities. Design characteristics in the following paragraphs shall be documented as necessary, and only to the extent necessary, to define the characteristics of the interface.

information transfer characteristics such as message characteristics (name, source, sink, size, frequency) and protocols in accordance with the Open Systems Interconnection (OSI) architecture defined in International Standard OSI 7498. Message content shall be defined by the Interface Requirements Specification, DID DI-MCCR-80026, required by DOD-STD-2167. The ICD shall document the exact design characteristics of the standard protocol or functional requirement as implemented in terms of bit pattern, or error detection and recovery methods, addressing, synchronization, etc. Each ICD shall have its respective content organized according to the following: Application layer, Presentation layer, Session layer, Transport layer, Network layer, Data link layer, and Physical layer. This paragraph shall be used to provide general information on the functional interface.

20.3.2.1 Paragraph 3.2.1, Application layer. This portion of the ICD shall define the functional and/or procedural characteristics which allow application processes (as defined in Section 6 of this standard) to access the information transfer processes. Characteristics which shall be defined may include, but are not limited to: identification of intended communications partners, their current availability to communicate, establishment of the authority procedures determination of the acceptable quality of service, and synchronization of cooperating applications.

20.3.2.2 Paragraph 3.2.2, Presentation layer. This portion of the ICD shall define the functional and/or procedural characteristics which negotiate the differences in the representation of information being transferred between application processes. Characteristics for negotiation of transfer syntax for character sets, test strings, data display formats, graphics syntax, file organization and data types shall be presented.

20.3.2.3 Paragraph 3.2.3, Session layer. This portion of the ICD shall define the functional and/or procedural characteristics needed to organize and synchronize the dialogue and to manage the information exchange between application processes. Characteristics for synchronization of end user tasks, mapping tables for names to addresses, dialog control (who, when, how long, half or full duplex), graceful session connection establishment/termination, encryption, and applicable protocols shall be specified.

this layer.

20.3.2.5 Paragraph 3.2.5, Network layer. This portion of the ICD shall define the functional and/or procedural characteristics which establish, maintain, and terminate switched connections between application processes. Applicable protocol, user options, timer characteristics, window size, logical connectivity requirements, and logical channel assignments shall be defined. Network characteristics of analog systems shall also be documented. These include in-band and out-of-band signalling, addressing and route selection, status control, message generation, flow control and alternate trunk routing, grade-of-service, queuing and priority requirements, and internetworking.

20.3.2.6 Paragraph 3.2.6, Data-link layer. This portion of the ICD shall define the functional and/or procedural characteristics which provide the logical establishment of data link connection, error detection and recovery, and flow control between stations transferring information. Link control protocol and related options shall be identified, including link level addressing, prefixes, supervisory sequences, minimum and maximum timer values, timer start/reset mechanisms, and recovery actions. The operation mode and command/response repertoire shall also be included for bit-oriented protocols. Analog network signalling characteristics shall be documented. These include signalling sequence definition, signalling error detection, and protocols for querying event status signalling.

20.3.2.7 Paragraph 3.2.7, Physical layer. This portion of the ICD shall define the functional and/or procedural characteristics which activate, maintain, and deactivate the physical connection between the peer data link entities being served. This portion shall define which piece of equipment is Data Terminal Equipment (DTE), and which is Data Communication Equipment (DCE). Information pertinent to the functions performed at the physical layer, including the protocol to be used, shall also be defined. Physical layer characteristics of analog systems shall be documented. In addition, any methods or schemes used to detect signal quality or channel equipment problems shall be documented. Electrical and mechanical characteristics are physical interface related and are discussed in paragraph 20.3.3 of this document.

subsystem/equipment item or the subsystem/equipment item to its facility. This portion shall also document the mechanical characteristics associated with the connection of a subsystem/equipment item to transportation and handling equipment.

20.3.3.1.1 Paragraph 3.3.1.1, Installation. Drawings shall show the interfacing facilities/subsystems/equipment items in their installed (or "mated") condition. In addition, the "halves" of the interface shall be separated and shown in detail views. Only that portion of the hardware applicable to the interface need be shown. Each component or part shall be identified along with the participant responsible for supplying it.

20.3.3.1.1.1 Paragraph 3.3.1.1.1, Interchangeability. Interchangeability shall be assured by careful documentation of all interfacing facility/subsystem/equipment item dimensions. This documentation shall include nominal dimensions with minimum and maximum tolerances. Special tooling or statistical analysis to insure interchangeability of close tolerance components shall be thoroughly documented.

20.3.3.1.1.2 Paragraph 3.3.1.1.2, Surface finish. Surface finish characteristics of interfacing surfaces shall be addressed by use of Government or industry standards or specifications. If no standard or specification is available or appropriate for the subject interface, all necessary information shall be included.

20.3.3.1.1.3 Paragraph 3.3.1.1.3, Location and orientation. Equipment and connectors shall be located with respect to recognized datum features or bench marks. Location shall be shown in two different views.

20.3.3.1.1.4 Paragraph 3.3.1.1.4, Holes. Hole callouts shall give all information necessary to assure compatible mating of interfacing components. Parameters to be considered include: datum references, diameter, depth, angularity, counterbore, counter-sink, spot face chambers, slotted holes, tolerances and protective finish.

20.3.3.1.1.5 Paragraph 3.3.1.1.5, Fasteners. Fasteners used to assemble interfacing components shall be identified by use of the appropriate Government or industry standard or specification number. If a standard or specification number is not available, all fasteners pertinent to the interface shall be described. Characteristics to be documented shall include head type, size diameter, tolerance, thread definition, length, material, finish, and torque/installation values.

required, the weights of interfacing components shall be given using appropriate units and the cg located with respect to known datum features.

20.3.3.1.1.8 Paragraph 3.3.1.1.8, Materials. Materials at interfacing surfaces shall be identified by Government or industry material standards or specifications. If a standard or specification is not available, the material characteristics of the interface shall be fully documented.

20.3.3.1.1.9 Paragraph 3.3.1.1.9, Markings. Hardware markings which affect interface relationships, such as orientation arrows, warnings, or part identifiers, shall be carefully and completely documented on the drawing required by this subsection.

20.3.3.1.2 Paragraph 3.3.1.2, Connectors. All electrical/electronic connectors shall be documented by use of the applicable Government or industry standard or specification. If no standard or specification is available, the electrical and mechanical interface characteristics shall be fully documented in the ICD. Mechanical characteristics shall include size, pin/socket configuration, keyway indexing and tolerance, materials, finish, and torque. Electrical characteristics shall include pin-to-pin isolation, breakdown voltage, contact resistance dielectric properties, shell conductivity and bonding. These documentation requirements may be satisfied through the use of a combination of mechanical drawings, interface block diagrams, system descriptions, schematics, and interface wiring diagrams.

20.3.3.1.3 Paragraph 3.3.1.3, Fluids (gases and liquids). Fluid interface requirements shall be documented by use of standards and specifications. If none are available, all parameters of the fluid interface shall be individually documented. These parameters include pipe, tube, or hose diameters, composition, operating, and proof pressures. Clamp and fitting installation torque values, operating and proof pressures shall be documented. The contractor or organization responsible for supplying each item of a fluid interface shall be identified.

20.3.3.1.4 Paragraph 3.3.1.4, Transportation and handling. This portion of the ICD shall detail transportation and handling mechanical design characteristics which impact subsystem equipment item interfaces. Packaging design characteristics, including orientation arrows, stacking instructions, warnings, and cautions, shall be documented.

20.3.3.2 Paragraph 3.3.2, Electrical/electronic characteristics. This portion of the ICD shall document electrical/electronic characteristics of the interface. Electrical characteristics shall be defined as relating to the transfer of power between subsystems or equipment items within a facility. Electronic characteristics are those which relate to the process of signaling,

adequately document interfaces. The following are acceptable forms of specialized electrical/electronic interface documentation:

20.3.3.2.2 Paragraph 3.3.2.1, Electrical/electronic block diagrams. Block diagrams shall be employed to depict facility/subsystem/equipment item electrical/electronic interface relationships. Multiple level block diagrams shall be used to depict complex relationships. At a minimum, a block diagram shall:

a. Identify the interfacing facility/subsystem/equipment items by title, reference number, and responsible FAA project office/contractor. Interconnecting cables shall be identified by reference number and supplier. The responsible FAA project office/contractor shall be identified on each side of the interface.

b. Show the interconnecting relationship(s).

c. Locate the interface.

If an interface(s) is also described in another ICD, that document shall be referenced on the block diagram and in 1.3 of the ICD.

20.3.3.2.3 Paragraph 3.3.2.2, System description. A system description shall be provided to complement and supplement complex or multiple level block diagrams. It shall consist of a brief explanation of the purpose of the system, its operational characteristics, and the role of each interfacing subsystem/equipment item.

20.3.3.2.4 Paragraph 3.3.2.3, Schematics. Schematic diagrams shall be prepared for each interfacing circuit. Schematics shall be drafted per DOD-STD-100 using the electrical/electronic symbols shown in IEEE 315.

20.3.3.2.5 Paragraph 3.3.2.4, Interface wiring diagrams. Wiring diagrams shall be prepared for each electrical/electronic interface shown on the block diagram. Each diagram shall show the connectors in their "mated" condition and the wiring configuration of each. Signal/function-to-pin assignments shall be defined for each connector half to assure proper connection of the circuits involved. In addition to the above, the following characteristics shall be documented:

a. Hookup. Show all wires including jumpers, splices, spares, etc. Identify all unconnected pins including uninstalled pins, etc.

be included.

c. Shielding. Show shield groupings within equipment and cables, shield treatment of connectors for referencing to structure (both overall cable shields and individual wire/pair shields) or for carrying shields through interfaces, shield tie points, ohmic requirements for terminating shields, etc.

d. Bonding and surface preparation. Define any special surface characteristics or preparations such as flatness, stiffness, cleaning, coating, and/or plating requirements, etc.

e. Electrical/electronic referencing (grounding). Show how each circuit is connected to the common electrical reference(s) for power and signals as applicable.

20.3.3.2.6 Paragraph 3.3.2.5, Power capacity. Power interfaces shall be defined by specifying the output characteristics of the supply, the range(s) of loading over which they apply and tolerances. All modes of operation shall be considered: turn-on, turn-off, warmup, continuous, normal, load change, standby, emergency, etc. Power interface characteristics to consider include:

a. Voltage (AC/DC),

b. Frequency,

c. Current (nominal, maximum and minimum),

d. Transients (including surge current, overshoot, and recovery time),

e. Ripple,

f. Wave form,

g. Polarity (±), number of phases, phase rotation,

h. Protection (over voltage, under voltage, current limiting, short circuit),

i. Dynamic source impedance,

j. Maximum power and power factor,

k. Load profiles,

l. Maximum noise level.

characteristics necessary to prevent damage caused by heat generated by operating equipment to itself or to adjacent equipment shall be documented. Operating temperature ranges, heat transfer rates, conduction, convection radiation, and maximum allowable duration of heat transfer shall be given.

20.3.3.3.3 Paragraph 3.3.3.1.2, Cooling. Cooling characteristics shall be expressed for both normal and emergency environmental control system modes. In the case of forced air cooling, the parameters of heat dissipation, air mass flow rate, temperature, relative humidity, and maximum static pressure shall be documented. Liquid cooled systems shall document coolant chemical composition, rate of heat dissipation, coolant temperature values and tolerances, pull down and recovery rates, flow direction and resistance, etc.

20.3.3.3.4 Paragraph 3.3.3.2, Electromagnetic. Electromagnetic characteristics documented shall include frequency/amplitude stability and offset, bandwidth, pulse characteristics, spurious outputs and responses, intermodulation, transient susceptibility, magnetic susceptibility, harmonic and local oscillator emission/susceptibility.

20.3.3.3.5 Paragraph 3.3.3.3, Dynamic. Dynamic characteristics documented shall include shock, vibration levels, damping, and acoustics.

20.3.3.4 Paragraph 3.3.4, Envelope characteristics. Minimum and maximum space allotted to subsystem/equipment items shall be controlled by a drawing to assure facility and mutual compatibility and to mitigate possible detrimental interaction. Considered shall be cable diameter, bend radii, and support. Envelope characteristics shall also be related to the environmental characteristics discussed in 20.3.3.3 of this Appendix.

20.4. Section 4, QUALITY ASSURANCE PROVISIONS.

20.4.1 General. A Section 4 (as outlined in Figure 2) shall be contained in an ICD only to the extent that the ICD specifies interface requirements as opposed to interface design characteristics. It shall define the process for verification of interface requirements presented in Section 3 of the ICD. It shall describe verification philosophy and requirements, documentation and special test requirements, and responsibilities necessary to assure adequate verification of all Section 3 requirements. It shall also define the types of tests to be performed.

20.4.2 Paragraph 4.1, General. This paragraph shall present a short, general, overview of the verification process to be used to verify the requirements of the ICD.

enable the other contractor(s) or organization(s) to complete their verification activities (provide a magnetic tape containing expected inputs in the specified format, provide a female connector as specified, etc).

20.4.5 Paragraph 4.4, Verification methods and rationale. This paragraph shall describe the verification methods to be used in verifying each Section 3 requirement and the rationale for their selection. This paragraph shall list only those verification methods selected for this ICD. Verification methods to satisfy the requirements of this paragraph shall be selected from the following:

20.4.5.1 Inspection (I).

20.4.5.1.1 Hardware. Hardware inspection, as a method of verification, determines compliance without the use of special laboratory equipment, procedures, items, or services. Inspection shall be used to verify construction features, document and drawing compliance, workmanship and physical condition.

20.4.5.1.2 Software. Software examination, as a method of verification, consists of inspection, without the use of special laboratory appliances or procedures to determine compliance with requirements. This nondestructive examination includes review of software source and object listings to verify compliance with software documentation, requirements and coding standards as well as verification of the implementation of required mathematical equations. The success criterion for inspections shall be pass/fail.

20.4.5.1.3 Technical data and documentation (TD&D). Verification by inspection shall be the primary method of verifying technical data and documentation (TD&D). The inspection task shall consist of comparing the TD&D with the appropriate compliance and reference documents. Variations shall be identified and recommendations made to accept as written, rewrite all or the specific part(s) of the document, or to obtain a compliance deviation. The verification rating scale shall be pass, pass with exceptions, or fail.

20.4.5.2 Test (T).

20.4.5.2.1 Hardware. Hardware test measures performance during or after the controlled application of functional and/or environmental stimuli. Measurements require the use of laboratory and special test equipment, procedures, items and/or services.

candidates for testing with both contractor and operational personnel. Items such as fixed response procedures that are controlled by a technical document or directive shall be candidates for verification by testing. The quantative measures for the TD&D tests shall be time, errors, and deviations from the material order. These tests shall be used to verify the TD&D or the proficiency level of the personnel.

20.4.5.3 Demonstration (D).

20.4.5.3.1 Hardware. Hardware demonstration is the qualitative determination of properties of an end-item or component by observation. Demonstration is used without special test equipment or instruction to verify characteristics such as operational performance, human engineering features, service, access features, and transportability. Demonstrations are used to determine "pass/fail" conditions.

20.4.5.3.2 Software. Software demonstration is limited to a readily observable functional operation to determine compliance with requirements. Demonstration is primarily used for activities where data gathering is not appropriate verification. Demonstrations are used to determine "pass/fail" conditions.

20.4.5.3.3 Technical data and documentation (TD&D). Verification by demonstration of TD&D shall consist of contractor and/or operational personnel being observed using the TD&D to perform the tasks for which the TD&D was generated. The rating scale for this technique shall be a pass, pass with qualifications, or fail judgement regarding the successful completion of the tasks by the personnel utilizing the TD&D.

20.4.5.4 Analysis (A).

20.4.5.4.1 Hardware.

a. Engineering analysis. This type of analysis is usually an engineering design function. It involves study, calculation, or modeling of known or potential failure modes, reaction or interactions of specified parts, materials, and processes, and the design configuration with the known function, performance and/or probable effects of the operational environments. This analysis is normally used to verify margin when it is not desirable to test to failure.

processes of manufacturing.

20.4.5.4.2 Software. Software analysis processes accumulate results and conclusions, intending to provide proof that the verification of a requirement(s) has been accomplished. The analytical results may be comprised of interpretation of existing information or derived from lower level tests, demonstrations, analyses or examinations.

20.4.5.5 Paragraph 4.5, Verification phases. This paragraph shall provide further definition of the three verification phases referenced in the Verification Requirements Traceability Matrix (VRTM), Table I of this standard. These phases, subsystem acceptance testing, system integration testing and site acceptance testing, are used to emphasize the level of testing during which specific requirements are to be verified and the method of verification to be applied. This paragraph shall list only those phases applicable to this particular ICD.

20.4.5.5.1 Subsystem acceptance testing. This phase of verification is comparable to Developmental Test and Evaluation (DT&E) level testing and is usually conducted at the contractor's facility. It culminates in the acceptance testing of a configuration equipment item. NAS subsystem requirements shall be verified to the maximum extent practical at this level to avoid the more costly correction of design flaws discovered later during NAS system integration testing.

20.4.5.5.2 System integration testing. This phase of verification is that testing conducted during Operational Test and Evaluation (OT&E) to determine that the hardware/software to be deployed for site installation will perform in a NAS environment, in accordance with system level operational and performance requirements. This phase of testing does not include the integration testing conducted at a subsystem level during DT&E. This verification involves assuring that hardware/software functions as specified with simulated and, if possible, actual inputs. NAS system integration testing involves the operational verification of a NAS subsystem after it is placed in its intended NAS environment. It is conducted at the FAA Technical Center (FAATC) and/or the key site.

20.4.5.5.3 Site acceptance testing. This verification phase emphasizes the demonstration of overall system performance requirements at an operational site. Demonstration and inspection are the methods most often employed during this phase. Subsystem/equipment item site acceptance testing is also conducted during this phase.

interface requirements verification analyses shall be performed in accordance with the VRTM.

20.4.7 Paragraph 4.7, Verification characteristics. This subsection provides any additional information regarding the verification of specific requirement (method of simulation, use of a special test tool, minimum number of test cases, etc.). These additional verification shall be cross referenced to the appropriate Section 3 requirement in the VRTM remark column.

20.5 Section 5, PREPARATION FOR DELIVERY.

This section is not applicable to this appendix.

20.6 Section 6, NOTES.

20.6.1 Paragraph 6.1, Definitions.

20.6.2 Paragraph 6.2, Abbreviations and acronyms.

30.1 SCOPE

30.1.1 Scope. This appendix defines the minimum requirements for the content of an IR.

30.1.2 Purpose. The purpose of this appendix is to establish uniform instructions for the minimum content and format of an IR.

30.2 APPLICABILITY

30.2.1 IR applicability. The IR shall be used to change interface control documentation.

30.3 INTERFACE REVISION (IR)

30.3.1 Interface revisions, general. An Interface Revision (IR) shall be used to change interface control documentation. Any participant to interface control documentation may originate an IR. A separate IR shall be required to revise each drawing of multi-drawing documents and each volume of multi-volume book form documents. Reasons for originating an IR include:

a. Correcting drafting or typing errors.

b. Improving or expanding the interface requirement/definition.

c. Adding information to complete an incomplete document.

d. Bringing a document into accord with actual design or operation.

e. Incorporating requirement or design changes made to resolve interface incompatibility.

30.3.2 IR format. Sheet 1 of an IR shall be the 8-1/2 by 11-inch form shown in Figure 3. If additional IR pages are required, the continuation form shown in Figure 4 shall be used. Plain 8-1/2 by 11 or larger pages may be used to replace complete pages or to change large pictorial areas.

30.3.3.2 Document title. This block shall contain the title of the document being revised.

30.3.3.3 Document page/volume number. This block shall contain the page or volume number, as applicable. On single book-form ICDs enter "DOC".

30.3.3.4 IR number. An IR number may be used only once. The same number shall appear on each sheet of the IR.

30.3.3.5 IR page number. This block shall show the sequence number of the IR page. On page 1 only, it will be followed by the total number of pages in the IR. On a single page IR, enter "1 of 1".

30.3.3.6 Revision letter. This block shall be left blank. It is reserved for use by the document originator at the time of IR incorporation to identify the revision letter under which the IR was incorporated.

30.3.3.7 Approval block. Same as document signature requirements except IR originator shall be listed first.

30.3.3.8 Reason. This block shall contain a concise description of the reason for the IR.

30.3.4 IR change description, general. The body of the IR shall contain a detailed description of the changes to be made to the document. Each change shall be itemized, by number, on the IR form. The location of each change shall be specified. For book-form documents, the page and paragraph, figure, etc. shall be given. For drawings, the zone, detail, etc. shall be given. Previous unincorporated IRs shall be referenced if the change affects or cancels something added or changed by those IRs.

30.3.4.1 Change description. An accurate description of each change shall be given, along with any special instructions for site incorporation. If the change modifies an existing interface description, both the old and new configuration shall be shown and identified using the words "was" and "now", respectively. When an entire paragraph is to be changed, the words "revise paragraph to read as shown" may be used. If the change involves new

"IR reference only." IR reference material is not to be incorporated.

30.3.4.3 Book form replacement pages. If a change involves most of an entire book-form page, a replacement original page may be prepared and included as part of the IR. The IR number and IR sheet number shall be penciled in at the top of the page. When replacement pages are provided, the instruction "replace document page x with page y of this IR" shall be used in the IR change description.

30.3.4.4 Oversize pages. If a change description for a drawing requires more space than is available on the 8-1/2 by 11 IR form, larger pages may be used to supplement the IR. Pages used in this manner shall carry the IR number and an appropriate IR page number. Change descriptions made on supplemental IR pages shall be referenced by appropriate instruction words on the basic IR form (e.g., "make changes as described on page 3 of this IR"). At least 1/2-inch margin shall be maintained on all sides of supplemental IR pages.

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